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Richard Sulphur
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NEW YORK & OHIO COMPANY

WARREN, OHIO. U.S.A.

PACKARD LAMPS.

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419-6.

J. W. PEALE, President.
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J. P. GILBERT, Superintendent.



New York & Ohio Company

MANUFACTURERS OF THE

PACKARD
INCANDESCENT
LAMPS

Main Office and Works:

Warren, Ohio, U. S. A.



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MADE BY
THE WERNER COMPANY
AKRON, OHIO

The PACKARD INCANDESCENT LAMP has been on the market since 1889, we having been one of the first independent companies to engage in the manufacture of lamps. Our factory has been continuously under one management and a constant improvement has been effected in our product. Our factory equipment is unsurpassed by any and having lately largely increased our facilities, we are now better prepared than ever before to supply any requirements in our line promptly and with an article which we unhesitatingly claim to be superior, for general use, to any lamp ever before made. It has always been our policy to turn out the best, regardless of cost and we have spared no pains or expense in obtaining the most advanced processes and equipment to carry on the manufacture of incandescent lamps.

A chemical process of exhausting lamps has been employed by us since 1892. This process is unique and distinct from any other used and is of the greatest value to the quality of our product. The vacuum obtained is one of perfect insulating qualities and it is to this process that the unique behavior of our lamps, in absolutely maintaining their candle-power and efficiency, is largely due. In our present product the "curve of candle-power" is very nearly a straight line, showing a very slight rise in the first fifty hours of burning, only. The importance of this feature cannot be overestimated and *the value of a lamp which will hold to its full candle-power throughout its useful life, is much greater than that of the ordinary lamp which necessarily, continually falls off from the start.* This maintenance of candle-power in our lamp is not obtained at the expense of efficiency, as the total watts consumed at no time exceeds its initial value. Since we adopted our improved process of pumping in 1892, every lamp during its evacuation and treatment has received individual attention, it never having been our practice to treat lamps in lots of 100 or more as has been universally done by other makers.

In appearance and workmanship our lamps are unsurpassed. We use the finest moulded bulbs and of one make only, that of the Corning Glass Works, whose product is noted for its brilliancy and clearness. We use no second hand material, such as cleaned up bases, nor do we repair lamps or carry any stock of these on hand.

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The recent reckless competition in the price of lamps, particularly by manufacturers who are not equipped to turn out the best product, has led to every possible cheapening, with the result that the cheap lamps being offered are the most expensive which it is possible to buy. *We have never adopted a process for cheapening our output, which could in the slightest degree lower its efficiency.* We have developed all of our own processes in our own factory, building all of our own machinery. Our prices were never lower than at present and we do not believe that a better value can ever be given in an incandescent lamp.

We claim superiority not only for the actual candle-power of our lamp but also for the quality or color of the light which it gives. This unique quality has always been characteristic of our Mogul 200 and 300 C. P. lamps and we have now commercially applied the same process to and obtained the same results on our standard product. We can truly call this lamp a "Smokeless" lamp, as there is not the slightest discoloration throughout its life, provided it is not run far above its normal brilliancy.

Our standards of candle-power are absolutely correct and may be relied upon. Some makers are obliged to adopt a high standard of candle-power in order to allow for the inevitable and immediate falling off which takes place when their lamp is placed in service, and it should be remembered that this falling off in candle-power *is not accompanied by a corresponding falling off in the watts consumed.* When the candle-power is overrated, the efficiency is overrated also. For instance, a lamp giving actual 16 candle-power and taking 50 watts, operates at an efficiency of 3.2 watts per candle, while if the lamp is really giving but 14 candle-power (and in no make of 16 candle-power lamp other than our own, can more than this be expected after fifty to one hundred hours of burning) it is operating at an actual efficiency of say 3.6 watts per candle-power. If it is life only which is to be considered, these inferior lamps may show up better than a really good lamp, as falling off in candle-power and efficiency as they do, they will naturally live longer at their actual operating efficiency of say 4½ watts per candle-power, than will a lamp which maintains throughout, its initial candle-power and efficiency *as does the Puckard lamp.*

Life alone, if considered without due regard to maintained candle-power and efficiency, is of small importance. At the present low prices for lamps, doubling the number of lamp re-

newals adds but little to the cost of operation, while it may increase the lighting efficiency 40 or 50 per cent.

The illuminating power of a lamp is defined in candle-power. The candle-power varies somewhat in different directions, but for practical purposes is generally taken in a horizontal direction when the lamp is suspended vertically with the filaments so placed as to be all visible from the point of view at which it is regarded. Each of our lamps is measured while revolving, so that the actual average illumination is obtained and when at its proper candle-power, the watts consumed by each lamp are measured, as well as the volts or E. M. F. required to bring it to that candle-power. A perfect evenness of product, both as to illuminating power and as to current consumed, is thus assured.

The power taken by a lamp is measured in watts and a watt is defined as the power conveyed by a current of one ampere, flowing through a circuit under a pressure or electro-motive-force (E. M. F.) of one volt. The wattage of a lamp is the number of watts required to bring it to its marked candle-power. The efficiency of a lamp is usually expressed in watts per candle-power and is the quotient obtained by dividing the total watts taken by the lamp (which is the product of the volts multiplied by the amperes) by the candle-power. If we wish to determine the number of lamps which can be operated per electrical horse-power, we divide 746 by the number denoting the total watts taken by the lamp. The quotient gives the number of lamps per electrical horse power. 746 watts are the equivalent of one electrical horse-power.

As electricity is generally sold by kilo-watt-hours, representing an expenditure of an energy of 1000 watts for one hour of time, we may wish to determine the number of hours in which any lamp will use one kilo-watt, or unit, of electricity, or the number of lamps which could be operated for one hour by one kilo-watt: In this case, we divide 1000 by the total power in watts taken by the lamp and the quotient obtained is the desired answer.

The currents, in amperes, taken by lamps of various candle-power, voltages and efficiencies are shown in the tables on page 8.

PARTICULAR ATTENTION is called to the table on page 7 showing the average life and efficiency which may be expected of lamps when operated at voltages other than normal. This matter of the actual efficiency of lamps is one which is seldom clearly understood. It is often claimed by various manufacturers that they have finally succeeded in making a lamp of $2\frac{1}{2}$ watts per candle efficiency. We wish to point out, by aid of the table, that this matter of making a lamp of particularly high efficiency does not rest entirely with the manufacturer. Every lamp we make is a 2 watt lamp—if operated at the voltage and corresponding candle-power which may be necessary to make it burn at that efficiency—that is, every lamp we turn out is made in the best possible manner and to stand operating at the highest possible efficiency, but *the actual efficiency at which it operates is decided solely by the voltage of the circuit on which it is used*. Of course, if the lamp is operated at its rated candle-power, it is of the efficiency for which we send it out. For instance, take a standard 3.1 watt lamp designed to give sixteen candle-power at 100 volts. If operated at 100 volts or 100% of its normal efficiency, this lamp may be expected to give an effective life of 580 hours. If operated at 98 volts, the lamp is actually working at an efficiency of 3.34 watts per candle and a life of 760 hours may be expected from it. If, on the other hand, this lamp is operated at 106 volts, it becomes an actual 2.5 watt lamp (but of course of a higher candle-power than its normal) and a life of more than 280 hours should not be expected from it. A consumer who orders, for instance, sixteen candle-power, 3.1 watt lamps, intending to run them 4% above their actual voltage, should understand that these same lamps, as he operates them, are actually 2.7 watt lamps and a corresponding shortening of their life should be expected. The table is of course approximate only, but embodies the results of extensive and careful tests which we have carried out.

RULE:—To find the efficiency of an incandescent lamp; multiply the voltage of the circuit *at the point where the lamp is used* by the amperes of current taken and divide the product by the actual candle-power given by the lamp. The quotient will be the efficiency in watts per candle-power. *Bear in mind that the actual candle-power is not necessarily represented by the number printed on the label with which the lamp is decorated.*

Efficiency and Average Life of Lamps at Various Voltages.

Efficiency in Watts per C. P. at Normal Voltage	Average Life at Constant E. M. F.	98 per cent. of Normal Voltage		99 per cent. of Normal Voltage		100 per cent. of Normal Voltage		101 per cent. of Normal Voltage		102 per cent. of Normal Voltage		103 per cent. of Normal Voltage		104 per cent. of Normal Voltage		105 per cent. of Normal Voltage		106 per cent. of Normal Voltage	
		Actual Watts per C. P.	Actual Life in Hours	Actual Watts per C. P.	Actual Life in Hours	Actual Watts per C. P.	Actual Life in Hours	Actual Watts per C. P.	Actual Life in Hours	Actual Watts per C. P.	Actual Life in Hours	Actual Watts per C. P.	Actual Life in Hours	Actual Watts per C. P.	Actual Life in Hours	Actual Watts per C. P.	Actual Life in Hours	Actual Watts per C. P.	Actual Life in Hours
4.5	2400	4.85	3500	4.68	2900	4.5	2400	4.34	2060	4.21	1830	4.06	1600	3.92	1400	3.8	1240	3.7	1120
4.	1500	4.31	2000	4.16	1750	4.	1500	3.86	1330	3.74	1160	3.62	1020	3.48	880	3.38	800	3.28	710
3.5	900	3.77	1200	3.64	1040	3.5	900	3.38	800	3.27	700	3.16	620	3.05	550	2.96	490	2.87	440
3.1	580	3.34	760	3.22	660	3.1	580	2.99	500	2.9	460	2.8	400	2.7	360	2.62	320	2.54	280
2.5	260	2.69	350	2.6	310	2.5	260	2.41	230	2.34	210	2.26	190	2.18	170	2.11	150	2.05	140

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Current in Amperes Taken by Lamps at Various Voltages and Candle-Powers.

3.1 Watts per Candle.

Candle-Power	50 Volts	55 Volts	60 Volts	65 Volts	100 Volts	105 Volts	110 Volts	120 Volts	220 Volts
5	.50	.45	.31	.26	.25	.24	.23	.21	.11
15	1.0	.90	.62	.52	.50	.47	.45	.41	.23
25	1.6	1.4	.97	.82	.75	.74	.70	.65	.35
35	2.0	1.8	1.2	1.1	.99	.94	.90	.83	.45
50	2.8	2.5	2.0	1.7	1.6	1.5	1.4	1.3	.74

3.5 Watts per Candle.

Candle-Power	50 Volts	55 Volts	60 Volts	65 Volts	100 Volts	105 Volts	110 Volts	120 Volts	220 Volts
5	.56	.51	.35	.30	.28	.27	.26	.23	.13
15	1.1	1.0	.70	.59	.56	.54	.51	.47	.26
25	1.8	1.6	1.1	.97	.88	.84	.80	.73	.35
35	2.3	2.0	1.4	1.2	1.1	1.1	1.0	.94	.51
50	3.3	2.9	2.2	1.9	1.8	1.7	1.6	1.5	.80

4 Watts per Candle.

Candle-Power	50 Volts	55 Volts	60 Volts	65 Volts	100 Volts	105 Volts	110 Volts	120 Volts	220 Volts
5	.64	.58	.40	.34	.32	.31	.29	.27	.15
15	1.3	1.2	.80	.68	.64	.61	.58	.54	.29
25	2.0	1.8	1.3	1.1	1.0	.95	.91	.84	.45
35	2.6	2.3	1.6	1.4	1.3	1.2	1.1	1.1	.58
50	4.0	3.7	2.5	2.2	2.0	1.9	1.8	1.7	.97

Standard Styles of Bases.



Fig. 1— $\frac{2}{3}$ Size.

Cuts above show clearly the different standard styles of lamp bases in use, adapting lamps to be fitted to sockets of different systems. In placing orders it is of course absolutely necessary, that the style of base used shall be specified. The bases we use are of the best make and are all new, are firmly cemented to the lamps and, before shipment, lamps are tested in the sockets for which their bases are designed.

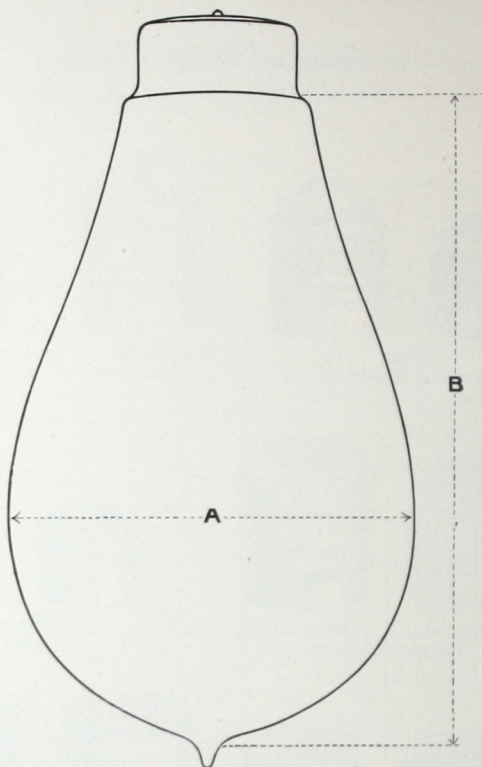


Fig. 2.

C. P.	A	B
4 and 6	1 $\frac{7}{8}$ "	2 $\frac{5}{8}$ "
8 and 10	2 $\frac{1}{8}$ "	3 $\frac{1}{8}$ "
16 and 20	2 $\frac{3}{8}$ "	3 $\frac{3}{4}$ "
32	2 $\frac{3}{4}$ "	4 $\frac{1}{8}$ "
50	3 $\frac{3}{8}$ "	5 $\frac{1}{4}$ "
100	4 $\frac{1}{4}$ "	7"
Window	2 $\frac{1}{16}$ "	2 $\frac{1}{16}$ "
Sign	1 $\frac{1}{16}$ "	1 $\frac{1}{4}$ "
Candelabra	2 $\frac{1}{4}$ "	3"
Tubular	1"	4"
8 C. P. } 220 Volt }	2 $\frac{3}{8}$ "	3 $\frac{1}{8}$ "
16 C. P. } 220 Volt }	2 $\frac{3}{4}$ "	3 $\frac{7}{8}$ "
200 C. P. Mogul	5 $\frac{1}{2}$ "	7 $\frac{1}{2}$ "
300 C. P. Mogul	6 $\frac{3}{4}$ "	8 $\frac{1}{2}$ "

The illustrations in the following pages show our regular line of standard lamps. Any of these lamps except the Mignols and Sign lamps can be fitted with any of the bases shown on page 2. The sizes of standard bulbs may be ascertained from the diagram and table on page 16. To find the length from tip to bottom, or length over all, there must be added to the length B as given in the table, the length or depth of the base used and about $\frac{1}{8}$ inch for the tip.

These standard lamps are also furnished in genuine colored glass, dipped colored, etched or frosted, etc.

All standard lamps are furnished of any desired efficiency, 1.5, 2.5, 3.5 and 4 watts per candle-power being regular.

Many styles of decorative and fancy lamps are also regularly made. Particulars and prices of these will be furnished upon application.

We are ready to receive orders for any description of incandescent Lamps of practicable patterns, and we will design lamps for any specific purpose if the requirements of the customer are made known.

We wish to call the attention of users of **Alternating Current Apparatus** to the fact that we manufacture the

PACKARD TRANSFORMER

full particulars of which we would be pleased to furnish upon request.

Six Candle-power 50 Volt Lamp.

(Standard Edison Base.)

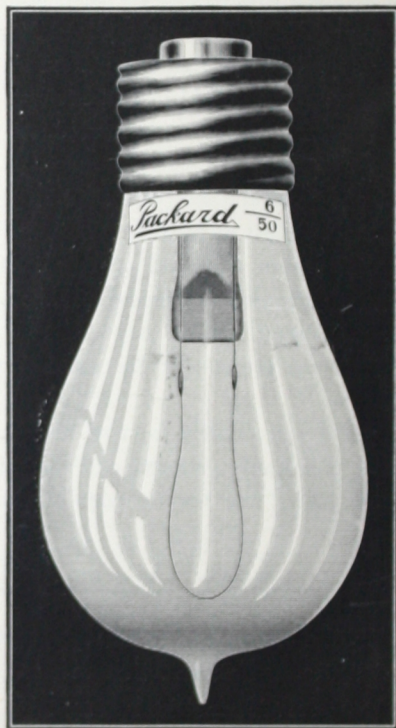


Fig. 3—Full Size.

The above cut shows our six candle-power 50 volt lamp with standard Edison plaster filled base. Any standard base can be fitted.

Eight and ten candle-power low volt class of lamps are of similar appearance to the above, differing only in size.

Range of voltage of this type of lamp, 45 to 60 volts.

Sixteen Candle-power 50 Volt Lamp.

(Sawyer-Man or Westinghouse Base.)



Fig. 4—Full Size.

The above cut shows our standard sixteen candle-power 50 volt lamp with Sawyer-Man base. Any standard base can be fitted.

These lamps are when so ordered furnished with twisted (old Sawyer-Man style) filament or with coiled filament (see Fig 5.)

Twenty-five, thirty-two and fifty candle-power low volt lamps are similar to the above, differing only in size.

Range of voltage of this type of lamp, 45 to 60 volts.

Sixteen Candle-power 52 Volt Lamp.

(Thomson-Houston Base.)



Fig. 5—Full Size.

The above cut shows our standard sixteen candle-power low volt lamp with coiled filament.

Low volt lamps are furnished with these coiled filaments when so ordered.

*Six Candle-power 110 Volt Lamp.**(Patent Pending)**Fig. 4—Pat. Sec.*

This design has shown and described the candle-power lamp for use and thereby is now described and recommended being the design which is most approved of light is required. This described is a six candle-power lamp of the standard type.

Range of voltage 110 to 120 volts.

Ten Candle-power 110 Volt Lamp.

(Edison Base.)



Fig. 7—Full Size.

The above cut shows our standard ten candle-power (eight candle-power also furnished) lamp for 110 volt circuits.

Made of any desired efficiency and fitted with any standard base.

Range of voltage, 90 to 130 volts.

Sixteen Candle-power 110 Volt Lamp.

(Edison Base.)



Fig. 3—Full Size.

Our Standard Lamp and unquestionably the most perfect lamp on the market. Standard efficiencies 3.4 to 4 watts per candle-power.

Range of voltage, 90 to 130 volts. Any base fitted.

Sixteen Candle-power 110 Volt Lamp.

(Anchored Filament Edison Porcelain Insulated Base.)



Fig. 9—Full Size.

The above cut shows our standard anchored filament lamp, which is furnished for any service desired, but is designed primarily for a **Street Railway Lamp**, for which use they are carefully selected for series burning. On account of its evenness of current consumption and in the lower efficiencies, exceedingly long life, this lamp is far superior to any other for railway service.

Furnished in any desired voltage and base.

Thirty-two Candle-power 110 Volt Lamp.

(Edison Base.)



Fig. 10—Full Size.

It is particularly in the higher candle-powers that our unique processes producing a **Smokeless** lamp, show their great advantage. These lamps do not run abnormally hot, nor do they blacken.

Standard range of voltage for these lamps, 80 to 130 volts. Any desired efficiency and base furnished.

Fifty Candle-power 110 Volt Lamp.

(Edison Base.)



Fig. 11— $\frac{3}{2}$ Size.

Range of voltage, 90 to 130 volts.

Any desired efficiency and base furnished.

100 Candle-power 110 Volt Lamp.

(Edison Base.)

Fig. 12— $\frac{1}{2}$ Size.

The above cut shows clearly our standard high-candle-power lamp, made in 75, 100 and 150 candle-powers, the only variation being in the size. These are furnished of any desired efficiency and with any base.

Range of voltage from 45 to 130 volts.

We claim this to be the only thoroughly satisfactory, high-candle-power lamp.

Sixteen Candle-power 110 Volt Tubular Lamp.
(Edison Base.)

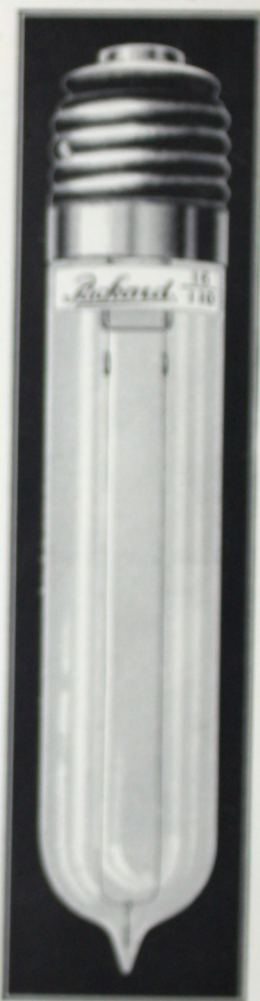


Fig. 13—Full Size.

The above cut shows clearly our Tubular or Candle lamp. This is sometimes called a "lanthorn" lamp, from the fact that it was first designed for use in examining the interior of casks and barrels. Furnished in 8, 10 and 20 C. P. Range of voltage, 45 to 60 and 90 to 120 volts.

Sixteen Candle-power 110 Volt, One-half Frosted Lamp.

(Standard Thomson-Houston Porcelain Insulated Base.)



Fig. 14—Full Size.

The above cut shows a very neat effect, produced by frosting, by our improved sand-blast process, one-half of the bulb of an incandescent lamp. This process can be applied to any of our lamps with slight additional charge. If preferred, the upper half of the bulb or that next the base, will be frosted.

Sixteen Candle-power 110 Volt, One-half Frosted Lamp.

(All Porcelain, Thomson-Houston Base.)

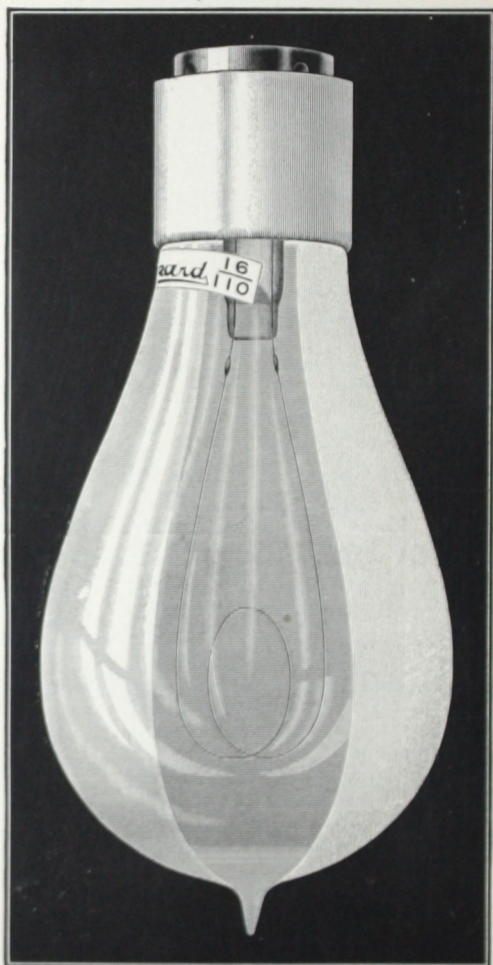


Fig. 15—Full Size.

The above cut shows another variety of frosting, or etching the globes of incandescent lamps. In this, one-half of the lamp from the tip to the base is obscured. In certain situations, as for instance a desk lamp used horizontally, this is a very neat and effective arrangement. The process can be applied to any of our lamps.

Sixteen Candle-power 110 Volt Window Lamp.

(Edison Base.)

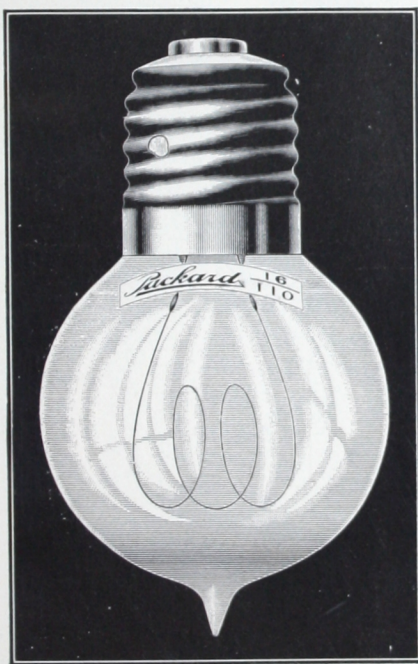


Fig. 16—Full Size.

The above cut shows our round bulb or so-called window lamp, used largely for decorative purposes and in special shades, furnished in eight, ten and sixteen candle-powers. Range of voltage from 45 to 60 and 90 to 130 volts.

Five Candle-power 110 Volt Lamp.

(Edison Base.)



Fig. 17—Full Size.

The above cut represents our five candle-power 110 volt lamp in seal or candleless bulb. These are made in five and eight candle-power and fitted with any standard base. They are especially suitable for decorative work and for use in small studios. Range of voltages from 45 to 40 and 90 to 110 volts.

Two and Three Candle-power 12 Volt Lamp.

SIGN LAMP.

(Edison Candelabra Base.)

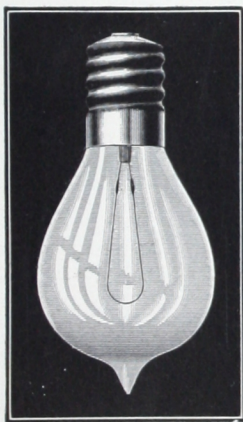


Fig. 18—Full Size.

The above cut represents our so-called sign lamp. These are regularly fitted with the Edison candelabra base as shown, but can also be fitted with the Edison miniature base. They are selected for series burning.

They are very largely used for sign and decorative work and being given all the care and attention which we give our regular lamps and submitted to the same refining processes, they are far ahead, in quality, of the many so-called, miniature lamps on the market.

Fifty Candle-power 50 Volt Lamp.

(Thomson-Houston Side Cut-Out Base arranged for Series Burning.)



Fig. 19— $1\frac{1}{2}$ Size.

The above cut shows our standard fifty candle-power 50 volt lamp with the old style of Sawyer-Man twisted filament. The lamp shown above is adapted for series burning, being selected for amperage and is provided with the standard Thomson-Houston film cut-out base. These lamps for standard multiple work are furnished with any standard bases desired. Where they are wanted for series burning it must be so specified and the exact number of amperes stated.

Range of voltage of the above type of lamp from 45 to 60 volts; amperage about 3.5.

150 Candle-power 110 Volt, Lantern Lamp.

(Edison Base.)

Fig. 20— $\frac{2}{3}$ Size.

The above cut represents our so-called lantern lamp, designed especially for use in stereopticons. A one hundred candle-power lamp in the same size bulb is also furnished. For use on alternating current and for special work in connection with the magic lantern, these lamps are in considerable demand. Fitted with Edison or Thomson-Houston base. The efficiency of these lamps is very high and a long life must not be expected of them.

Eight Candle-power 220 Volt Lamp.

(Edison Porcelain Insulated Base.)

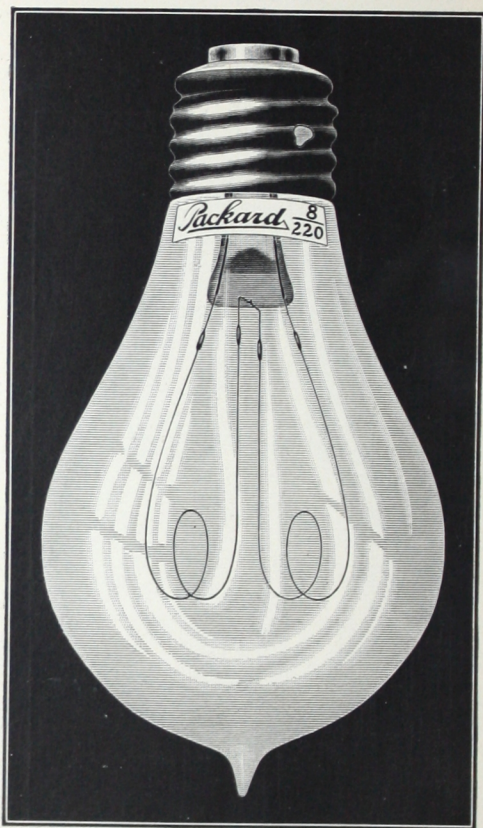


Fig. 21—Full Size.

The above cut shows clearly the construction of our eight candle-power, high voltage lamps, made in voltages from 180 to 250. These lamps have been put out only after a very exhaustive series of experiments and tests and we unhesitatingly claim them to be superior to any other high voltage lamp on the market. We have followed the universal European practice and the teaching of our own tests, in using two coiled filaments in series, being certain that we thus obtain a much better lamp than can be made by any system of multiple coils in a single filament. The necessity for an anchor is also dispensed with. Any standard base furnished.

Sixteen Candle-power 220 Volt Lamp. (Edison Porcelain Insulated Base.)

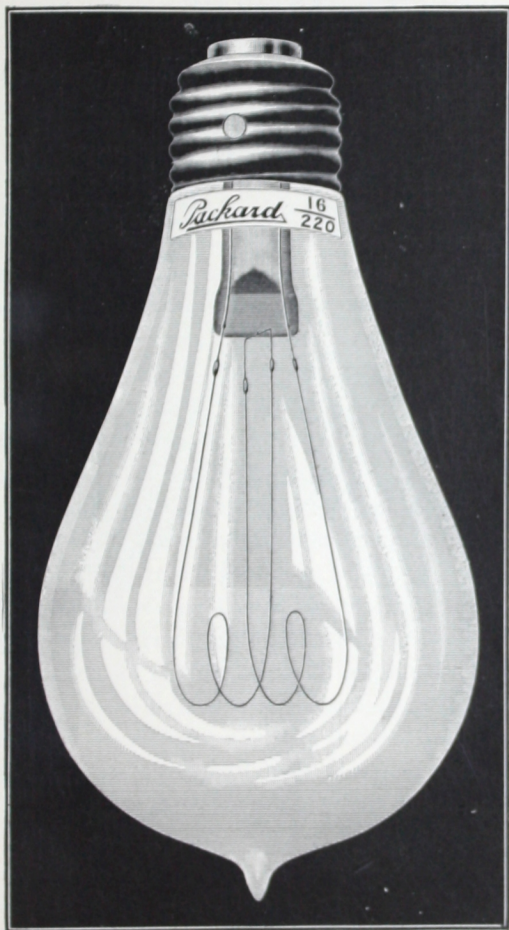


Fig. 22—Full Size.

The above cut shows clearly the construction of our sixteen and thirty-two candle-power high voltage lamps. These are in all respects similar to the eight candle-power high volt lamp, except in size. The perfect vacuum we obtain in our lamps is evident in these high voltage lamps. A lamp produced by the old process, if subjected to a pressure of 220 volts would be almost certain to explode or bombard. With our process there is no danger whatever of this occurrence. The filaments are sufficiently stiff to sustain themselves in place and are not injured by unequal strains. The standard efficiency of these high voltage lamps is about 3.8 watts per candle-power, although different efficiencies can be furnished. Any desired base will be fitted.

The Mogul Lamp

Cut of which is shown on opposite page, and of which we are the only American Manufacturers, is the highest development of the lamp-maker's art. By years of persistent experiment, and at great expense, we have perfected these lamps. They are made in 200, 300, 500 and 1,000 Candle-power. They are entirely reliable, and are a perfect substitute for the group of 16 Candle-power incandescent lamps or the so-called incandescent arc lamp. They have many features to recommend them over either of these. The quality of the illumination furnished is unique, and is superior to any other, having the penetration of the arc, with the softness of the incandescent. This is especially noticeable when we attempt to distinguish colors by their light. For the same expenditure of energy, they will give a better illumination than an alternating current arc lamp; can be run from the regular transformer used for incandescent lighting; are noiseless and in all respects entirely unobjectionable. The saving in current over 16 Candle-power lamps, or the saving in carbons and attendance over incandescent arc lamps, will pay for the renewals of the Mogul Lamps. The Mogul Lamps are also furnished for series burning for use on street railway and power circuits, operating perfectly 5 in series on 500 volts, and thus used, are cheaper and more satisfactory than arc lamps.

These lamps require a special porcelain socket, which with other fittings, is illustrated in the following pages.

Current Required for Mogul Lamps.

200 Candle Power, 50 Volts	10 to 11 Amperes.
200 Candle Power, 110 Volts	5 to 6 Amperes.
300 Candle Power, 50 Volts	14 to 16 Amperes.
300 Candle Power, 110 Volts	7 to 8 Amperes.

Three Hundred Candle-power, 110 Volt, Mogul Lamp.

(Showing Special No. 1 Porcelain Socket Attached.)



Fig. 23— $\frac{1}{2}$ Size.

Two hundred and three hundred candle-power kept in stock, five hundred and higher candle-powers made to order. Standard efficiency 2.5 watts per candle. Range of voltage 45 to 125 volts.

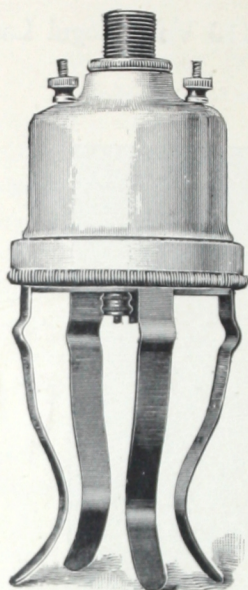


Fig. 24, No. 1 Socket.

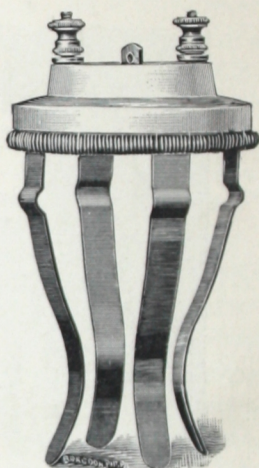


Fig. 25, No. 2 Socket.



Fig. 26, Porcelain and Tin Plain Shade.

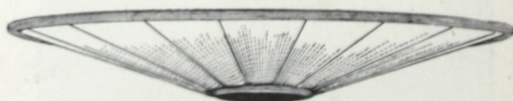


Fig. 27, Convex Mogul Mirror Reflector.



Fig. 28, Concave Mogul Mirror Reflector.

DIPLOMA



We received the highest award in a competitive test of our lamps at the World's Fair in Chicago in 1893. The lamps tested were not, as is usual, specially made and selected at the factory, but were supplied by one of our agents, from old stock and so were beyond question representative of our standard product.

